

Spring 5-14-2010

Landscape Urbanism for the Highway city of Springfield North End

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Landscape Urbanism for the Highway city of Springfield North End

By

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**University of Massachusetts Amherst
Department of Landscape Architect and Regional Planning**

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Introduction

The expansion of transportation and roadway systems in the United States has caused drastic socioeconomic changes in cities. Springfield's North End is one of them. The Interstate highway I-91 from Chicopee to South Springfield divided three neighborhoods; Liberty Heights, Memorial Square, and Brightwood. Consequences of the separation include: changed community relations, disconnected access to the Connecticut River and parks, polluted water, air, and sound, as well as other health issues. More than 20 years after the expansion that the separation the city continues to struggle with the adverse effects.

Landscape architects are able to see opportunities in these problems. The Interstate I-91 has four lanes, two directions on both sides, which are wide 100 feet on each side that create many currently unused spaces along them. The idea is to turn those negative spaces (highway leftover area) into the positive living system (four co-ecological systems) by using the landscape urbanism concept as example framework.

Landscape Urbanism is a new design method that creates a new frame of design process and development for all designers. It was introduced by Charles Waldheim on 1997 in Chicago Conference. The designers are encouraged to look across other related multiple disciplines to learn the different system or functions -- infrastructure, hydrology system, culture, history, wildlife habitation, and so on-- and overlay them together for the better

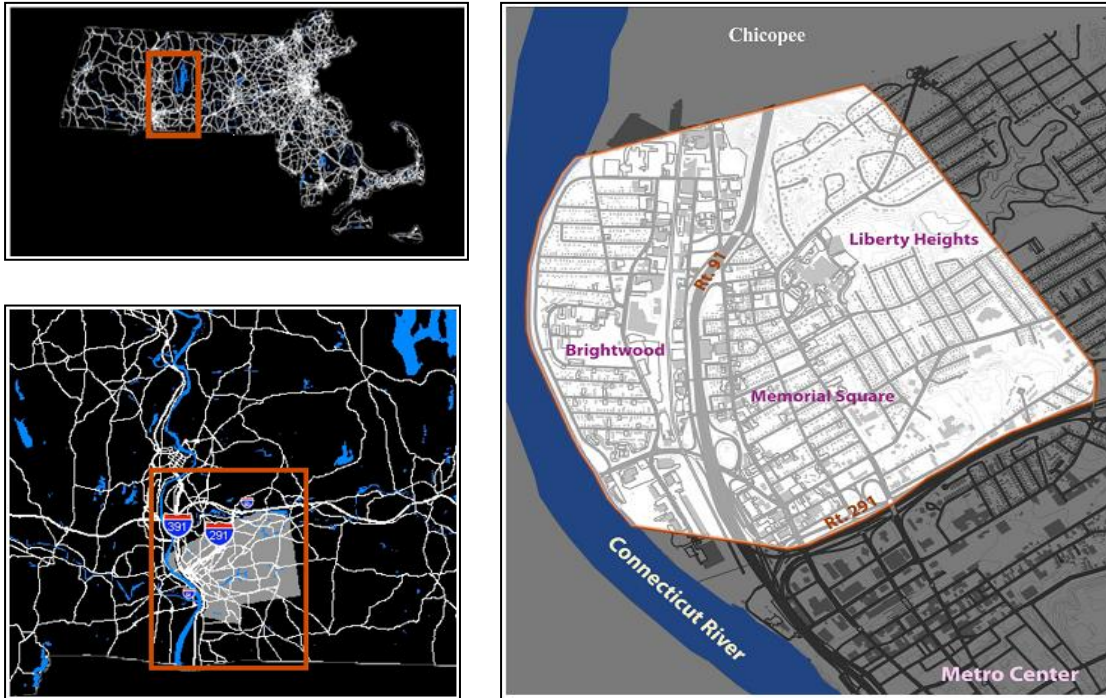
ecological relationships in design. It emphasizes the importance and competence of landscape, which work better in the organizing the city.

The Four Co-Ecological System is a sustainable system, which combined the Springfield North End major problems and Landscape Urbanism concept. It has consisted with: 1) A Green Highway: corridor buffer and connection, 2) Hydrological/ Embankment Design and management, 3) Energy Efficiency Zone and Renewable Energy 4) Sustainable Infrastructural Highway Materials. Each topic focuses on different aspects along the Springfield North End highway based on the major issues. A Green Highway is a new concept for roadway design that integrates transportation functionality and ecological sustainability. Hydrological/ Embankment Design and management looks at the run-off water best practice management. Energy Efficiency Zone and Renewable Energy emphasizes on the development of energy efficiency town scale plan with combination of renewable energy. Lastly, Sustainable Infrastructural Highway Materials aim to utilize some of unused parts of highway turning those to more benefit areas. All four integrated systems work as a single machine unit process cycle for the future single social-culture of the North End neighborhood.

The thesis is an extended research based on the 497A urban design senior design studio in fall 2009 program of department of landscape architecture and regional planning. Some investigation had been done by senior students in landscape architect class of 2010. For example, urban form and usage, open space and transportation networks, physical

and social environment of urban communities, development of a larger framework and context for design, culture and history through the simultaneous use of plans, sections, and three-dimensional work models as the fundamental information and guide line to understand the overall areas and information. The research scope will look at the cities with the similar circumstance or problems around the world as case studies for applicable solutions, programs, and designs. The most important benefit of the thesis is the understanding of Springfield North End Issues, taking some part of the landscape urbanism concept, and be able to use it as a framework to establish a network or system for design. It will be another research support document for the town of Springfield. The research will be a good guide line for the future commonwealth college students in Landscape Architecture and Regional Planning program who are interest to learn about the landscape urbanism either involved with highway problems or else as well as use for department support reference in the future.

Springfield North End Highway Analysis/ Problems



*Figure (1) Context Map: State of Massachusetts, City of Springfield, and Details
(Making Connections - Envisioning Springfield's North End: Senior Studio Fall 2009)*

Springfield serves as the Southern Gateway into Massachusetts. The North End of Springfield is located north of downtown along Main Street, with I-291 to the South and the I-91 Springfield–Chicopee border to the North. To the West the Connecticut River is a natural boundary, and to the East the boundary is defined by Armory Street. The North End comprises three neighborhoods: Brightwood to the West along the Connecticut River, Memorial Square in the center, and Liberty Heights to the East.

The city of Springfield is alive with culture, history, and diversity. It is known as “a city of homes’ and in many ways, has a small town feel within a large city. Springfield boasts

one of the highest Percentages of open space per capita in New England and is home to many schools, museums, and historic buildings.

History

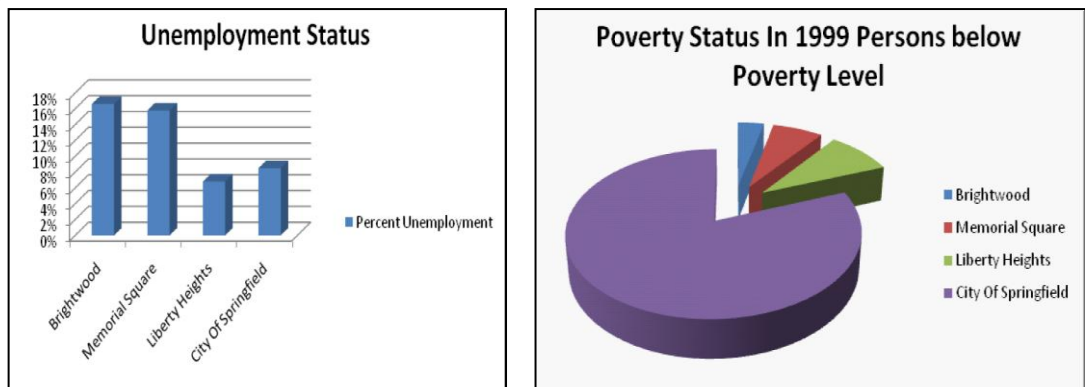


*Figure (2) History Photos of the City of Springfield on 1960.
(Making Connections - Envisioning Springfield's North End: Senior Studio Fall 2009)*

Springfield MA in Western Massachusetts was founded by William Pynchon in 1636 and became an important city for industry and manufacturing since it was selected in 1770 as the United States Armory. The decline of industry in the United States after the Second World War and the closure of the Armory in 1968 affected the economy of Springfield heavily. Today, health care/educational/social services provide the base of the economy, followed by wholesale/retail trade and manufacturing. A young and diverse ethnic population of 150,000 people lives in Springfield. Springfield is located next to the Connecticut River but has turned its back to the river since the 1960's when I-91 was constructed, connecting Vermont to Connecticut. Springfield, with its 350-year history, must showcase its assets to become a capital in the region. It has much to offer, and is home to New England's largest companies, such as MassMutual Financial Group, Bay

State Health, Smith and Wesson, and Big Y food Inc. The North End is comprised of three neighborhoods, Brightwood, Memorial Square, and Liberty Heights. It is bordered to the North by Chicopee, to the West by the Connecticut River, and to the South by Springfield's thriving Metro Center. Interstate-91 runs north and south, directly through the North End. In the early 1960's, Connecticut River Valley farm employed a large Puerto Rican Population. Many of these workers and their families have since settled in the area. Today, 10,000 residents live in Brightwood and Memorial Square (only a portion of Liberty Heights is included in our focus area) and 80% of the population is Puerto Rican, contributing greatly to the North End's strong cultural identity. It is also home to a number of community outreach groups that actively promote community well-being within Springfield.

Economy



*Figure (3) Unemployment Status and Poverty Status
(Making Connections - Envisioning Springfield's North End: Senior Studio Fall 2009)*

Based on the 2000 census, the North End has:

- 40% poverty rate and the lowest household income in the state
- Lowest educational attainment in the city

- Highest unemployment rate in the city
- Significant health problems such as asthma and diabetes

Assets



Figure (4) A variety of Asset in Springfield North End: Bay State Medical Center, Connecticut River, Several Green Open areas.

The North End has many other valuable assets as well. Several medical institutions are also located in the North End, including Baystate Medical Center, which is one of the largest employers in the region. Baystate represents some of the greatest buying power in the area and has a strong incentive to work towards improving its surroundings. The Connecticut River is a great natural resource. There are several green open areas such as Van Horn Park, Kennific Park, Bikepath and Walkway. A fairly number of neighbor diversity: Liberty Height is a high class family with bigger house, Memorial Square is

located on Main Street where the North End's commercial center, and Brightwood is a mid to low income family.

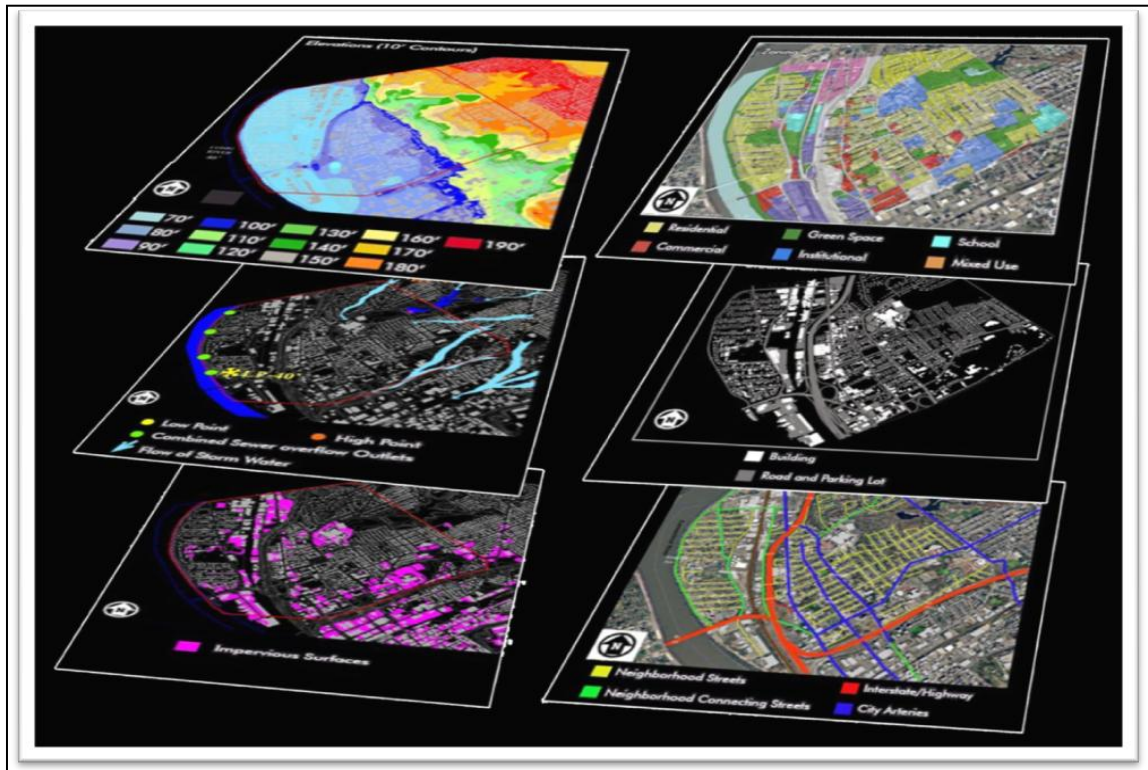
Areas along the Highway



Figure (5) Several Left Open Areas along the North End Highway are unused and filled with invasive plants.

The interstate I-91 creates severe physical barriers that bisect the community. However, the highway makes Springfield quite accessible to both Connecticut and to the rest of Western Massachusetts. There are four under passes under I-91 that people currently use for commuting. The highway is 20 feet above the ground with about 20-50 feet extend areas on both sides. The green spaces along the highway are mostly long thin and narrow but continue and connect with the large patch of forest on the North. Most people use this highway exit to get off to Bay State Medical Center.

Site Analysis



*Figure (6) A series of Analysis Map show each important analysis topic in Springfield North End.
(Making Connections - Envisioning Springfield's North End: Senior Studio Fall 2009)*

Topography is steep along the Connecticut River. Brightwood and Memorial Square are relatively flat, and much steeper to the East. A number of combined sewer overflow outlets are detrimental to the water quality of the Connecticut River. The North End consists primarily of residential neighborhoods and, for an urban setting, contains a large number of green spaces and parks. The majority of the North End's mixed use and commercial buildings are situated along Main Street in Memorial Square. Hospitals and the medical industry are present both in Liberty Heights and Brightwood. Those creates a very large portion of our project area is spanned by impervious surfaces.



*Figure (7) A composite map combines many important asses and site analysis in Springfield North End.
(Making Connections - Envisioning Springfield's North End: Senior Studio Fall 2009)*

Using terminology by Landscape Architect Kevin Lynch analyzed the North End accordingly. There are three neighborhoods: Brightwood, Memorial Square, and Liberty Heights. Major edges that define and block pedestrian traffic are Interstate 91 (bisects the North End), Interstate 291 to the south of Memorial Square and Liberty Heights. Major nodes are Van Horn Park, Calhoun Park, Kenefick Park, and the Schools (Gerena Magnet School, Chestnut Accelerated Middle School and Lincoln School). Major paths that connect the nodes and neighbor hoods to the Connecticut River Walk and Bikeway are denoted in green. One of the major paths is a pedestrian tunnel that connects Memorial Square to Brightwood. The tunnel starts at Baystate Hospital and the Medical Campus are two major outsider destinations in the North End.

Landscape Urbanism

Introduction

Landscape is emerging as a model for urbanism. Landscape has traditionally been defined as the art of organizing horizontal surfaces by paying close attention to these surface conditions- not only configuration, but also materiality and performance- designers can activate space and produce urban effects without the weighty apparatus of traditionally space making. Many issues facing contemporary designers of the built environment: the relationship between natural environments and processes of urbanization globally. After a decade of debates and theory development, many professionals and academics continue to be unclear about the idea of landscape urbanism. Many theorists have attempted to clarify meaning with different definitions, meanings, and a ways to describe to others; still people have a hard time understanding about it. So, who did invent the term and what actually is landscape urbanism?

When was it first introduced?

Landscape Urbanism, first introduced by Charles Waldheim from exhibition and a conference in Chicago on 1997, as design process or methodology. Waldheim defined Landscape Urbanism as a branch of landscape ecology, concentrating on the organization of human activities in the natural landscape. He highlighted the leftover void spaces of the city as potential commons. Waldheim saw Landscape Urbanism, like landscape

architecture, as an interstitial design discipline, operating in the spaces between buildings, infrastructural systems, and natural ecologies (Waldheim 10-14).

What is Landscape Urbanism?

Landscape Urbanism Landscape Urbanism is a movement within architecture in a broad sense; new paradigm of bringing together all related knowledge to the project. It uses many overlay planning and design of multi-system or information layers in a particular site location where will develop in over a period of time. Landscape Urbanism usually uses for the large scale projects - can be used for small scale as well- or development where there are complex systems and unpredictable variables. The designers are encouraged to look across other related multiple disciplines to learn the different system or functions -- infrastructure, hydrology system, culture, history, wildlife habitation, and so on-- and overlay them together for the better ecological relationships in design. It emphasizes the importance and competence of landscape, which work better in the organizing the city (Waldheim 70-80).

The main characteristics of Landscape Urbanism

The Landscape Urbanism is one of the new topics among designers. There are five important features that can summarize the unique characteristics of Landscape Urbanism (Ahern Zube Lecture).

1. Contextualization - Landscape is an important feature of the cities.

2. Using more of the horizontal design than vertical design. Meaning that landscape rather than architecture is more capable of organizing the city and enhancing the urban experience.
4. The approaching is a time-base strategy. Design through processing over time in the future. Landscape urbanism is not fixed, it is moving with the context and the circumstances- "Terra Fluxus."
5. New design thinking and methods for designers across multi-disciplinary. On its way, it needs all relevant knowledge, from whatever discipline, to solve its tasks and to develop a dynamic professional competence (Waldheim 20-28).

Why do people having hard time understanding Landscape Urbanism?

1. A rift between the design orientation and the planning orientation is an obstacle for the professional development. Landscape architecture has a unique combination of nature and social science, art and the humanities. This unique combination, that builds a competence to perceive and understand connections and relations, not least between different scale levels, is developed during the time in the academy and needs to develop even more in practice.
2. From a situation with long traditions of specialization, it is not an easy task to work and think in an interdisciplinary way. Each field has its own focus point. So, it is hard to think crossing through different fields or think differently from what regular basis.

3. Landscape Urbanism from a theoretical point of view is already hard to imagine how it will be, ever harder practically to use interdisciplinary models of understanding, designing, and planning over time and space.
4. The ability of handling uncertainties in more or less specified between space and time is greatly benefits to design, yet it solves many unpredictable issues or a variation of situations that might happen in the future. The designers cannot predict all future issues but Landscape Urbanism will help to control or prevent those. Dealing with uncertainties is tough to handle and cope with for designers, not only they might or might be happened but also depend on many factors that change the design over time. Therefore, it is hard to program for covering Landscape Urbanism (Linholm 6-10).

How will Landscape Urbanism relate to the thesis?

First of all, Landscape urbanism has a closed relation to landscape architect field. It brings together knowledge from architecture, landscape architecture, urban design, urban planning and landscape planning. Of all these specialties within architecture, I believe landscape architecture gets the most benefits out of accepting the concept of landscape urbanism. Such a step will not change landscape architecture as such, but it will create a bridge of communicating and influencing into the fields of planning, architecture and urban design and thereby provide a uniting landscape for those disciplines (Czerniak, and Hargreaves 10-12).

Second, the highway is one of the transportation infrastructures, which related with some part of Landscape Urbanism about the infrastructures as another important layer of information that have to be included into the design.

Conclusion

Landscape Urbanism is a rhetoric way of introducing the abilities and competence of landscape architecture, in a wider forum, a way to unify scientific and artistic activities and ambitions, in the trials to create possible solutions for the sustainable human society. It is an ecologic way of understanding the city and its components. It presents the importance of the space dynamic between city and landscape that are linking dynamically and relationally in ecology, sociality, and spatially. As designers or specialists, we have to accept that to get a successful environmental design; the works need cooperation and contextualization.

Four Co-Ecological System Concepts

North End has consisted with several potential factors to reconnect the disjointed neighborhood, fragmented ecosystem as well as to utilize the great unused assets in the area such as Connecticut River, Vanhorn Park, and Bay State Medical Center: four existing tunnels, embankment area on both sides, extensive forest patch on Northern side to Chicopee. The Four Co-Ecological System is a sustainable system, which combined the Springfield North End major problems and some Landscape Urbanism concept. It has consisted with: 1) A Green Highway: corridor buffer and connection, 2) Hydrological/ Embankment Design and management, 3) Energy Efficiency Zone and Renewable Energy 4) Sustainable Infrastructural Highway Materials. Each topic focuses on different aspects along the Springfield North End highway based on the major issues.

1. A Green Highway: Corridor, Buffer, and Connection

A green highway is a roadway constructed per a relatively new concept for roadway design that integrates transportation functionality and ecological sustainability. An environmental approach is used throughout the planning, design, and the construction. The result is a highway that will benefit transportation, the ecosystem, urban growth, public health and surrounding communities. Establishment of the Green highway will create the new ecosystem along corridor of the highway that functions as a buffer from

air and sound pollutions as well as connection for people and wildlife. This solution promotes safety and connectivity for human and animals (Operating Committee on Roadside Development 130-135).

Green Corridor Examples

Land Bridge: Prairie Crossing	Vancouver, Washington	Janes Jacob	August, 2008
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*Figure (8) Prairie Crossing is a good example of the pedestrian bridge over the highway.
(Landscape Architect Magazine February 2009)*

The Land bridge crosses over Highway 14, reconnecting the upland historic district, which includes a number of old army base building and open spaces, with the river. The project is dedicated to reconnecting the people of the Northwest with their history along 450 mile stretch of the river. The semicircle bridge spans 187 feet over and has a 3,800-foot pathway. The bridge offers views of Fort Vancouver, the Cascades, the Columbia River and Mount Hood. It helps connect the upland prairie to the river's edge. The bridge has interpretive components, such as a "Language Walk" featuring indigenous words about the land, people and river, as well as patterns and forms, such as the use of circles and basket geometry. There is also a timeline path with photo murals that reflect changes in the nearby land over time, as well as several overlooks and trellis systems. Landscape plantings are native to the area and drought tolerant. A new bridge over the freeway carries pedestrians and bicycles, along with a reestablished native plant community and opportunities for rest, reflection, and education about the area. People, Land, and River are celebrated there in English and in local native American languages. (Enlow, "Prairie Crossing").

Millennium Park Bridge	Chicago, Illinois	Frank Gehry	July, 2004
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BP Pedestrian Bridge is a pedestrian bridge crossing Columbus that connects Millennium Park to Daley Bicentennial Plaza in Grant Park. The Girder Bridge is the first bridge designed by Pritzker Prize-winner, Frank Gehry, and was named for British

Petroleum who donated \$5 million to the construction of the Park. The bridge is referred to as snakelike or serpentine in character due to its curving form.



*Figure (9) BP Pedestrian Bridge is beautifully, functional, and sculptural.
(Millenniumpark.org)*

Frank Gehry's bridge is a snaking, part span, part sculpture, part building, part viewing platform and part ramp that is accessible to the disabled. The bridge actually plays a vital urban design role, bringing pedestrians over the intimidating, expressway-like trench of Columbus Drive as they cross between Millennium Park and Daley Bicentennial Plaza to its east. It also serves as a giant noise buffer, its western approach forming a berm that shields the Jay Pritzker Pavilion and its Great Lawn from noisy car traffic on Columbus.

The bridge's design enables it to bear a heavy load and is known for its aesthetics. The skin consists of 9,000 stainless steel shingles, smaller versions of the ones that clad the Pritzker Pavilion. It has a pure form, no handrails to muck things up, just waist-high walls that hold you in a viewing platform allows you to look back at the skyline, out to the lake, or at the curving metal shells of Gehry's own Pritzker Pavilion and its monumental trellis(Millenniumpark.org).

Craigieburn Bypass	Melbourne, Australia	Peter Tonkin and Taylor Cullity Lethlean	2005
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*Figure (10) Craigieburn Bypass is standing welcome travelers to Melbourne.
(Craigieburn Bypass, Hume Freeway Australia)*

Sound walls and road furniture for a new 32 km stretch of freeway linking the Hume Highway with the Melbourne Ring Road were designed in association with Landscape Architects Taylor Cullity Lethlean. The project was designed to be experienced at a freeway speed of 110km per hour. The footbridge, spanning 65 m over the freeway, links housing to a protected expanse of native grassland. It includes three series of sculptural sound walls, a pedestrian bridge and a set of design parameters for road bridges, crash barriers and retaining structures. A major element of the work was a new pedestrian bridge, which was designed as a gateway to the distant city of Melbourne, visible on the horizon. The bridge, a complex curve in plan and elevation, is a tubular steel truss faced with the same austenitic steel as the main sound walls, which at this point appear to leap over the road in a gesture of welcome or farewell (Barbey, "Craigieburn Bypass, Hume Freeway, Melbourne, Australia").

2. Hydrological/ Embankment design and management

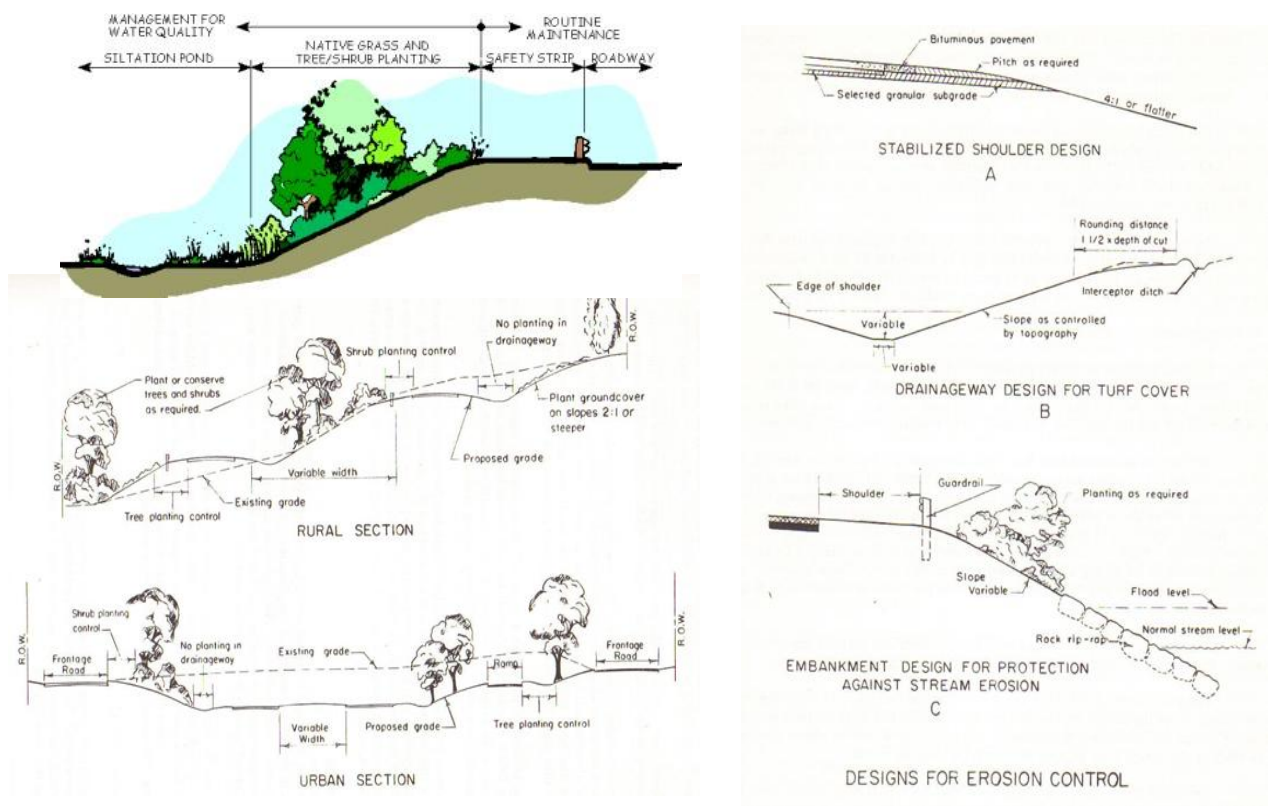
Water run-off is one of the major issues along the highway as well. The Springfield Northway is a raised 20-30 feet and extending 20-50 feet highway above both sides of the neighborhood. The embankments are unused and filled with the invasive plants.

Therefore clearing up the invasive and unwanted plants, there will be more open areas to re-design the embankment along the highway. Some areas have steep slopes that increase the flow speed of the run-off water and reduce the absorbing time. In the rainy season,

some highway exist area such as Gerena Magnet high school, was overwhelmed with the overflow run-off water from highway.

Cleaning up the dirty water from transportation is another parallel system that will work perfectly with the embankment. Some interesting natural process such as the phytoremediation or anaerobic digestion can be one option that applicable to filter the water before going into the ground.

Highway Embankment Examples



*Figure (11) Several Embankment Section and Design of the highway show the relationship between highway, surrounding nature and landform.
(National System of Interstate and Defense Highway)*

The sections show many different examples of embankment design: shoulders, drainage channels, and slope to control erosion by grading and by the establishment of vegetative cover. In regions too dry for growths of turf and groundcovers similar rounding of slope intersections and channels is suggested, but bituminous, stone, or other paving may be necessary to control erosion in gutters and channels.

A typical drainage way and side slope section readily protected against erosion on 4:1 fill slopes and on 3:1 or 2:1 slopes and steeper, groundcover planting may be desirable .

A typical embankment paralleling a stream. Riprap or other masonry protection is carried to a point above floodwater level. Above the riprap, the embankment is protected by planting of permanent types of woody vegetation.

On urban highways, structures such as curbs, retaining walls, grade separations, bridges, and interchanges. Form the framework of planting design. On open country roadsides, planting design is largely controlled by natural features such as hillsides, bodies of water, outstanding views, trees, and other existing natural growth as well as pavements and structures and land use outside the right-of-way(Operating Committee on Roadside Development,. *A Policy on Landscape Development for the National System of Interstate and Defense Highways*).

Hydrological Management Examples

Phytoremediation describes the treatment of environmental problems by the use of plants which mitigate the environmental problem without the need to excavate the contaminant material. The specific plants are able to contain, degrade or eliminate - oil or

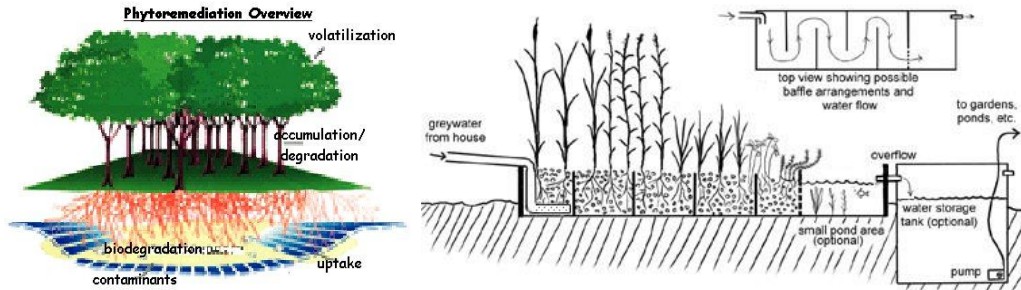


Figure (12) Phytoremediation requires some plant installation to set up multi-layer filter.
(What is Phytoremediation?)

contaminants, from the media that contain them. ("What is Phytoremediation")?

Anaerobic digestion is a series of processes in which microorganisms break down biodegradable material in the absence of oxygen. It is widely used as part of the process to treat wastewater. Some also used as a renewable energy source because the process produces a methane and carbon dioxide rich biogas suitable for energy production, helping to replace fossil fuels("Anaerobic Digestion").

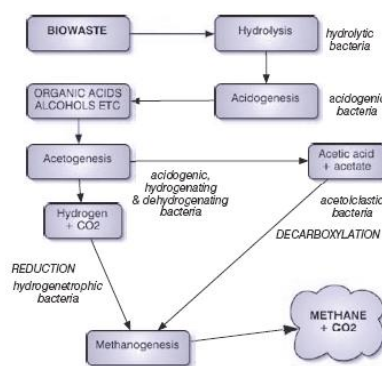


Figure (13) Anaerobic Digestion does not only clean the dirty water but also creates some renewable energy such as biogas.
(Anaerobic Digestion)

3. Energy efficiency zone and Renewable energy

To enhance power of the landscape, the city and its citizens should be a part of the future plan to complete the mission. The Energy Efficiency Zone is a long term plan for community to eager the town for the self-efficient energy in each household unit. Turning nature energy into family need daily basis energy.

Renewable energy is not a new story but also never be an old story, likewise it is developing all the times with the better technology. Wind, sun, and tides are three resources within close proximity to the Springfield North End highway that can be brought to produce energy to subsidize costs of the city. Two ideas are related with the energy efficiency ideas and should be considered of the combination plan.

Planning and Network Examples

Pioneer City 2030 is an ideal city planning for power up neighborhood in energy system. The idea is to create a number of local microgrids that share power across neighborhoods. It turned out that having power networks deployed on a neighborhood level proved more economically practical to generate renewable energy. Neighborhoods with numerous high-rise buildings are a case in point. A combination of large solar photovoltaic installations on major commercial and industrial roofs power microgrids, as do several utility-scale wind turbine clusters on the edge of the city, and combined heat and power

plants fueled with biogas and biomass from urban waste streams. Those heat power plants supply not only electricity, but also hot water and heat through pipe networks that serve the central business district and other densely occupied areas. Neighborhood heating and cooling substantially increase efficiency over each building having its own heating and cooling units. Pioneer City also draws substantial renewable power from distant, central installations including wind farms, solar photovoltaic and thermal plants, and wave and tidal installations. These are delivered to the city on a smart transmission grid that has been upgraded to handle the complex power flows from varying and sometimes unpredictable renewable sources (Mazza, "Pioneer City 2030).

A number of municipalities across the country are getting creative and experimenting with incremental, neighborhood- or district-based lending programs that help homeowners pay the up-front capital costs. Under what are called “renewable energy community” programs, offering homeowners or businesses within designated neighborhoods low-interest loans to complete efficiency or renewable energy projects.

("Neighborhood Assistance Program" *Great City*)

Renewable Energy Examples

Solar Flower Petal Street Lamps	Phillips	Simplicity Event 2008 Exhibition
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Inspired by how flowers open up to the sun to collect the sun’s energy, the sustainable city lights feature photovoltaic petals that open during the day to collect the sun’s rays

and transform them into energy. Then at night, the light closes and LED lights turn on to brighten city streets.

The LED lights feature motion sensors that are triggered once the sun sets by individuals walking in close proximity to the light. The intelligent outdoor lighting can enhance city life by providing accurate light effects where and when needed, adapted to the day's rhythm or triggered by activity ("Simplicity Event- Sustainable City Light." *Phillips*).

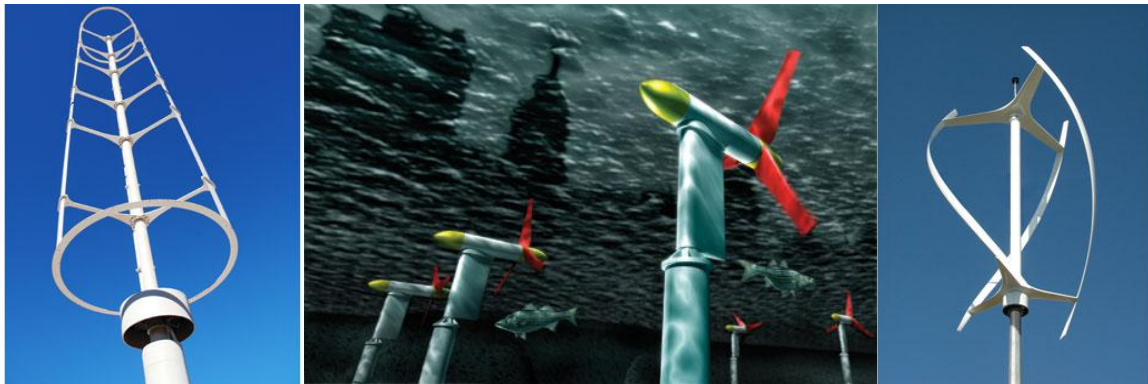


Figure (14) Phillips Street Lamps is a good example of solar energy mimicked from pure flower habit. (Phillip.com)

Tidal Turbines	New York City	April, 2007
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This is the tidal turbines, and their rotors are propelled by tidal currents instead of wind. The largest test of this new type of power production is under way in New York City's East River, with six 35-kilowatt turbines scheduled to be installed in a channel that's off-limits to large vessels. As the 16-ft.-dia. rotors spin, as close as 6 ft. to the water's surface, they'll provide power to a supermarket and a parking garage. Once the test wraps up, Virginia-based Verdant Power hopes to add hundreds more turbines, potentially reaching

a total capacity of as much as 10 megawatts — enough to power 4000 homes up to 130,000 gigawatt-hours per year — about half the yearly production of the country's dams — it's only a matter of time before major energy utilities begin testing the waters.



*Figure (15) Wind and Tide Turbines are another ways of renewable energy that are getting more popular in many places.
(The Jordanville Wind Farm)*

Wind Turbines	Dagenham, London	March, 2007
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The Quiet Revolution or QR wind turbine is designed for an urban environment with low wind speeds and changing wind directions. The QR helical design allows the turbine to collect wind from all directions equally. The first qr5 turbine was installed in Dagenham, a suburb of London, in March 2007. At the end of 2008, over 70 turbines had been installed throughout the United Kingdom, where each unit generates between 4000 and 10000 kilowatt-hours per year. The second is the windspire, another vertical wind turbine, similar to the Quiet Revolution. This 30-foot tall, 4-foot wide turbine generates 2000 kilowatts per hour given 12-mph winds, and it can survive winds up to 105 mph. It

has a tall, thin propellerless rotor. It generates power when wind spins its vertical airfoils. These wind turbines have been installed across the county in homes, museums, businesses, and schools. For example, the Michigan governor's residence has a wind turbine, and Quinnipiac College in Connecticut is planning to use the turbines on campus to help power its buildings ("The Jordanville Wind Farm").

4. Sustainable infrastructural highway materials

The use of local sustainable materials for design, maintenances, and construction can help to make use of the highway. Green design should be introduced to the neighborhood.

Green design is an idea of using materials in the most efficient way. The principles are simple: use materials wisely, conserve energy, save money in the long term, and create surroundings that are safe and healthy. The easiest way is to reuse on-site, nearby, or local materials to minimize the labor costs and buying new materials. In General, highway is one part of the transportation infrastructures that including such as structures (bridges, tunnels, culverts, retaining wall, signage and markings, electrical systems (street lighting and traffic lights) and edge treatments. To improve the whole infrastructure system will require an extensive amount of work from many disciplinary. The research has mentioned some of them on previous topic such as bridges, tunnels, street lighting, and edge treatment. One last interesting element want to explore is the vertical walls that are easily found all along the Springfield North End Highway.

Living wall examples

Goodwill-Milgard	Tacoma, Washington	Patrick Blanc	November, 2009
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Goodwill-Milgard Living Wall designed by Patrick Blanc in Tacoma, Washington. The green wall in Tacoma is his first exterior project in the United States. A twenty-by-forty-foot vertical green wall on the east side of the building at Tacoma Avenue and Center



*Figure (16) Goodwill-Milgard shows significantly the power of plants that can create a better use of hard surface.
(Tacomagoodwill.org)*

Street. The wall features nearly 2,200 plants from ninety-six different species arranged in a wavelike pattern that creates, according to the artist, an expression of “freedom.” There

are few flowers in sight, but the diversity of color, texture and form is remarkable. The wall has also attracted small insects and animals. The vertical garden gives us a view of the complete organism. We can see the roots. In the vertical presentation, the plants claim their space, roots intertwine, and relationships develop. It is a small ecosystem for animals and insects as well as a good opportunity for the young people coming here and learning many new things, to see a piece of nature (Bunker, "Tacoma").

PNC Headquarter	Pittsburgh, Pennsylvania	Mingo Design	September, 2009
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On the side of PNC headquarters building in downtown Pittsburgh, PA, the largest living wall of North America, designed by Kari Katzander of Mingo Design. PNC's living wall is not only beautiful, but helps to reduce energy use as well. This spectacular vertical garden is roughly the size of a doubles tennis court. The 2,380 sq foot living wall is soil based and includes many regional plants, all acquired locally within 500 miles of downtown Pittsburgh. The panels are reducing the temperature of the building, with preliminary studies showing that the wall behind the panels is 25% cooler than ambient temperatures. The eight varieties of plants are actually evergreen, meaning they should remain green throughout the year with some even flowering in the spring (Meinhold, "North America's Largest Living Wall Installation by PNC").



*Figure (17) Two different living walls turn unused vertical wall into beautiful and functional part of buildings.
(landscapeurbanism.org)*

Ann Demeulemeester	Seoul, Korea	Mass studies	2007
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An elegant version came from fashion retailer Ann Demeulemeester in Seoul, Korea. The living building was designed by Mass studies, a Korean based architecture firm on 2007. The building consists of four levels, shop, a multi-store and restaurant on the top floors. The project's facade is made from a geo-textile planted with herbaceous perennials to form a living wall. The greenery is carried interior and exterior; the extensive building coverage, the integration with windows, curves, wall, or elsewhere could possibly incorporating nature. The shop's location is in a residential neighborhood that is evolving into a shopping district. (Jason A., "Living Wall").

Recommendation

After understand the Four Co-ecological concepts and its examples, this part of the research will tell about how to apply those ideas to solve the Springfield North End highway issues orderly;

- 1) A Green corridor buffer and connection.
- 2) Hydrological/ Embankment design and management.
- 3) Energy efficiency zone and Renewable energy.
- 4) Sustainable infrastructural highway materials.

Each paragraph will restate what happened in existing conditions, problems, and researcher's recommendation based on the examples of each idea from the previous chapter.

1. A Green corridor buffer and connection

There are several ways of connecting people over or under the highways. First, the easiest way, is to utilize the existing tunnel by illuminated it such as Craigieburn Bypass in Melbourne, creatively cooperated the art of lighting and structure. Not only promote people to use the path but also resolve the safety issues from car accidents and crime. Second, the pedestrian bridge should be considered as another for Springfield North End. Even though it is a tough challenge and requires time and money, it is a good alternative way and will provide much more benefits. The Landbridge in Washington is a great proved example of the successful pedestrian connection; functional, historical, and ecological design. Thinking the connection is an important landmark for people. Make it visible and useable; bring people in to celebrate the new connection, which will also attract travelers as well. Furthermore, we have to bring in both surrounding nature and highway together for creating the green highway corridor that functions as the environmentally safe travelling way and ecologically buffering edge that encourage and promote locally relation of neighborhood while provide animal movement and habitat. Most of the left over space along the highway are fragmented, narrow, and thin; densed with understory shrubs and invasive plants, also do not have many big trees. Trees are

important to reduce the noise level, pollution, and screen vehicle movement for residential from highway. I would recommend the town to plant more native trees and re-vegetate the lower understory plants and groundcover in the left over area used the highway guidelines of planting; they will be not only vegetation edge to buffer from highway and direct people from both neighborhood to the connection bridge but also provide animal habitats and enhance their movement to other areas.

2. Hydrological/ Embankment design and management.

The best management practice for North End should look at the combination of a series of terrace embankment with groundcover and bioretention swales. The consideration should reduce a number of grey water as well as create the better hydrological system and visual pleasing to the community living nearby. A variety typologies in embankment design can use in order to slow down the run-off water and increase the area to absorb the water in the drainage system such as terraced terrain riprap stones/gravels, and retention basins as shown in previous topic.

The Highway needs at least one filtration to make water cleaner by using either phytoremediation or anaerobic digestion before piping to the river. This can be done easily with the retention basin area nearby the site. Installed the treatment plants such as Alpine pennycress, Thlaspi, or Amaranthus retroflexus- those are some expert plants on responses to environmental stress, mineral nutrition, and soils contaminated with heavy metals and radioisotopes- at some major drain areas such as the Bay State Medical Exit to

filter some heavy particles and oil from the transportation. That can clean and eliminate some mixed particles in dirty water before let the cleaner one through the other resources. Then, double filter run-off water in sewage system with anaerobic digestion. Almost any organic material can be processed with anaerobic digestion. Biogas from sewage works is sometimes used to run a gas engine to produce electrical power; some or all of which can be used to run the sewage works. Some waste heat from the engine is then used to heat the digester. That might be another filter option that provides the great benefit to city.

3. Energy efficiency zone and Renewable energy

Many cities in the United States of America have been purposed and developed the town scale energy plan such as renewable energy community in Berkeley, California where the city or involved organizations support particular designated neighborhoods for low-interest loans to complete efficiency or renewable energy projects. The behind idea is that to have an individual being self-efficiency and reduce the city center energy. It is a long term plan that eventually will bring back an incredible result in next 15 or more years for community and family. The town should at least be studied or researched the energy efficiency zone or plan or may adapt similar strategy that applicable to the neighborhood with smaller budget and faster result.

The North End Springfield neighborhood is mainly Latino and people are mostly low-income family. Unfortunately, the town of Springfield has a limit budget to spend for a long term project. However, there are some private non-profit organizations in North End that have been helping people and developing the community for more than 10 years, called NEON, North End Outreach Network lead by Joaquin Rodriguez. The organization is now focusing on the quality life, job distribution, and education for Latino community. If the city can provide some support to NEON to establish some fund or connect to fund resources, they might have a chance to expand their future plan in integration some energy efficiency plan or research for people.

With a new advanced technology, many new designed wind turbines do not require much strong wind to trigger its function any more. The QR or Quiet Revolution wind turbine is a good low-wind operate example. It also can collect wind from any direction with a smart fan design. Springfield North End has a fair amount of wind along the highway, so this should be one option to be considered to utilize the wind power. Phillips has presented brand-new smart street lamps on 2008 exhibition. The innovative lamp is called "Solar Flower Petal Street Lamps." It blooms to absorb sun energy during the day and transform to provide a bright light street lamp at night. The intelligent lamps are adjustable interactively with users around them. The design is not only to save energy and money but to use it more efficiency as well. Ideally, the smart lamps can help to reduce a number of Horse Shoe spot light along the highway and save more energy. Lastly, similar concept with the wind, tidal turbine uses river current to operate and

transform into electricity. The Connecticut River is a good resource to experiment the idea. All above ideas are some great examples of the renewable energy concept that turn the natural power into positive energy. Several areas have potential to install some of those utilities and make them part of the natural and educational green energy corridor. The town can use them to teach community and children about the future energy of the world as well.

4. Sustainable infrastructural highway materials

Many parts of the retaining wall along the Springfield North End are typically left blank, no-used, and unattractive. They are mostly impervious concrete, which will not help for drainage system. Some interesting ideas like living walls can help to utilize the unused vertical hardscape elements in a different way by make them beautifully alive and greatly benefits. By adding plants to traditional highway walls it helps not only to screen the unpainted surface but also collect some water on the vertical surface off the highway and the embankment. Most living wall examples are usually done with the tall walls or high buildings. Living wall is not as hard as it look. On the highway area, it should not use too fancy planting plants. It can be done with one simple plant or local resilient plant for example vine, is one of the most common and the easiest plant that can be used. Not only it will cover the hard surface, but it can change color seasonally as well.

How do four systems work as a single machine to resolve the disconnected community?

Step:

1. To educate and trigger community about the circular sustainable system that will reconnect and redevelop the neighborhood.

: To educate, promote, and communicate to community are a grass root for future development and commitment. People will truly understand the process and work together in both communities.

: Resolve => neighborhood intangible barrier, confusion, lack of community support
2. To locate the green connection and corridor location along the highway either tunnel or bridge

: This is a significant step because it is a main attraction for both pedestrians and vehicles.

: Resolve => neighborhood disconnection and safety issues.
3. To begin with revegetate and redesign the embankment to set up the new ecological system of the highway and reduce the run-off dirty water before pipe to the Connecticut River.

: The second important step will hugely support much strong defined ecological edge and path

: Resolve => waste left over space, lack of the ecological system, animal habitat and corridor. movement, run-off water, air pollution, noise, and traveling visibility.

4. To combine some renewable energy technologies or inventions in the major area
: Promote the educational green energy opportunity among community, long term energy cost deduction, take advantage of major assets in the area.
: Resolve => waste left over space, lack of energy efficiency plan
5. To use the local plants, materials, and expertise in constructions, planting, and details.
: Promote local economy supports both products and personals, use more sustainable materials.
: Resolve => material costs and efficiency
6. To monitor the system by community eyes
: Use the community base as an inspector to generate the strong system.

All four integrated systems work as a single machine unit process cycle for the future reconnection of the North End neighborhood.

Conclusion

The North End of Springfield aligns along two major highways, I-91 and I-291, in West and South orderly. The North End comprises three neighborhoods: Brightwood, Memorial Square, and Liberty Heights. Memorial Square and Brightwood have a rich Hispanic culture but a very low average household income. The most physical challenges in the North End as a whole is the

fragmentation of the area by two Interstates-- I-291 and I-91--and the Springfield-Holyoke Railroad Line. The major assets include the closed proximity to downtown Springfield as well as the North End's thriving medical industry, which includes Baystate Medical Center and Mercy Medical Center. The medical industry is, one of the largest employers in the region as a whole. The Connecticut River and Van Horn Park are significant natural and potential recreational resources for the North End but are characterized by a lack of connection to and integration into the adjacent neighborhoods.

As the world change every day as well as other such as landscape, ecosystem, cities, and so on, therefore, the designers try to come up with the design approach to handle and provide a longer flexibility for space and human. The answer is Landscape Urbanism.

Landscape urbanism is a movement, theory, concept, or method within design fields that provides the visionary framework for an interdisciplinary urban discourse, counteracting several disciplinary and other related professional to find possible solutions for the sustainable human society. It is an ecologic way of understanding the city and its components. It presents the importance of the space dynamic between city and landscape. Many important characteristics of Landscape Urbanism are such as a time-base strategy, horizontal design, multi-disciplinary, flexibility handling uncertainty, and more. However, Landscape Urbanism is still new and complicated and requires much experience to think beyond for the future unpredictable problems.

It should be addressed and integrated in regular course for much more benefits in student knowledge and practice for better understanding and design approach as well as it will be a good establishment for wider connection and learning with other related fields.

Learning from Springfield North End highway and Landscape Urbanism, combines some part of the theory with the major issues of the site, eventually brought into the Four Co-Ecological system;

- 1) Green Highway: Green corridor buffer and connection.
- 2) Hydrological/ Embankment design and management.
- 3) Energy efficiency zone and Renewable energy.
- 4) Sustainable infrastructural highway materials.

Those four concepts are based on finding the ways to solve the neighborhood existing issues that work together as a single system. Green highway aim to reconnect three area to be able to access and share the natural assets on both side, promote the wild life movement and habitat, and provide more benefits to the travelers on highway for better scenery. To redesign embankment is a simple and practical method to response and support the hydrological system around the highway. Several embankment designs can be applied to fix the run-off problem, to slow down the water, and increase more time to filter to the ground. Double filter water with phytoremediation before going into the pipe and anaerobic digestion before piping the water to other sources. People must know and think that all the problems are not specific for city or some particular organization to resolve but they are all should be responsible and be part of the system to solve those

problems. Energy efficiency zone is an ideally residential area for self-efficiency power to subsidize the money for energy in each household unit. Taking advantages of solar, wind, or water to make the best use of them in many different ways. Lastly, should be the first consider before installation, is the sustainable infrastructure material. Most of the highway wall are party that mainly unused and unattractive for people. To utilize the area wisely will provide more benefit to the highway, hydrological system, and education for community. Living wall is a good example for it.

The most important benefit of the thesis is the understanding of the landscape urbanism concept and be able to apply some part of the theory into specific site design. It will be another research support document for the town of Springfield. The research will be a good guide line for the future students who are interest to learn about the landscape urbanism either involved with highway problems or else as well as support for master degree research in landscape architecture field in much deeper level project in the future.

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